

# PATENT ABSTRACTS OF JAPAN

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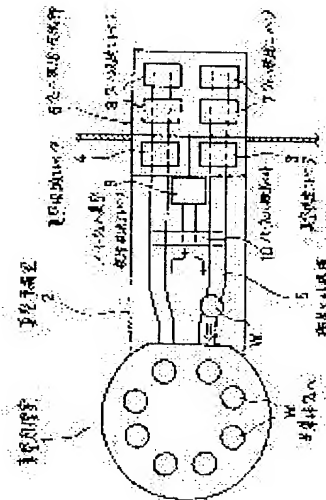
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## (54) SEMICONDUCTOR MANUFACTURING DEVICE

### (57)Abstract:

**PURPOSE:** To shorten a supply and a housing time and to prevent moisture and dust from penetrating into a vacuum chamber by a method wherein a dummy wafer vacuum supply and a housing elevator capable of supplying a dummy wafer to or housing it in the vacuum treatment chamber and a transfer means are provided.

**CONSTITUTION:** A wafer supply and housing section 6 is provided in an atmosphere outside a vacuum preparatory chamber 2, and a supply elevator 7 and a housing elevator 8 are provided facing toward a vacuum supply elevator 3 and a vacuum housing elevator 4 respectively. And, a dummy wafer vacuum supply and housing elevator 9 and a dummy wafer transfer belt 10 are installed inside a vacuum preparatory chamber 2, so that a dummy wafer can be mounted on or dismounted from a dummy wafer transfer mechanism 5 to be supplied to and housed in a vacuum treatment chamber 1. When the dummy wafer needs to be supplied to the vacuum treatment chamber 1 at a maintenance time or the like, it is placed on the transfer belt mechanism 5 from the dummy wafer vacuum supply and housing elevator 9 and the dummy wafer transfer belt 10 to be supplied. And, the dummy wafer is housed in the dummy wafer vacuum supply and housing elevator 9 from the transfer belt mechanism 5 after the treatment has been finished.



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## SPECIFICATION

### 1. Title of the Invention

Semiconductor Manufacturing Equipment

### 2. What is claimed is:

1. Semiconductor manufacturing equipment,  
comprising:

a vacuum processing chamber;

a wafer loader/unloader for loading a semiconductor wafer into and unloading it from said vacuum processing chamber; and

a preliminary vacuum chamber disposed between said vacuum processing chamber and said wafer loader/unloader; said preliminary vacuum chamber including a dummy-wafer vacuum loading/unloading elevator capable of loading a dummy wafer into and unloading it from said vacuum processing chamber, and a dummy-wafer conveying mechanism.

### 3. Detailed Description of the Invention

(Utilization Field in Industry)

The present invention relates to semiconductor manufacturing equipment, and more particularly, to

semiconductor manufacturing equipment for processing semiconductor substrates (semiconductor wafers) in a vacuum processing chamber.

(Prior art)

Typical conventional semiconductor manufacturing equipment of this type is constructed in a such manner that as shown in Fig. 3, in a vacuum processing chamber 1, a preliminary vacuum chamber 2 is integrally disposed so as to communicate therewith and a vacuum loading elevator 3 and a vacuum unloading elevator 4 are provided inside the preliminary vacuum chamber 2 in order to load a semiconductor wafer W into and unload it from the vacuum processing chamber 1, respectively, along a conveying belt mechanism 5. Wafer loading elevators 7 and wafer unloading elevators 8, each disposed in a loader/unloader 6 for semiconductor wafers arranged in the atmosphere, are each provided in opposed form to load and unload the semiconductor wafer W internally/externally to the preliminary vacuum chamber 2.

Also, in this type of manufacturing equipment, during manufacturing tests and maintenance operations, processing is provided using a dummy wafer. Accordingly, dummy-wafer loading/unloading elevators 12 each for loading/unloading this dummy wafer into/from the vacuum processing chamber 1 are also provided in the wafer

loader/unloader 6.

[Problems to be Solved by the Invention]

In the conventional semiconductor manufacturing equipment described above, since the dummy-wafer loading/unloading elevators 12 are each provided outside the preliminary vacuum chamber 2, a dummy wafer needs to be loaded/unloaded from the atmospheric side during tests and maintenance. Accordingly, there is the problem that at this time, since the preliminary vacuum chamber 2 needs to be set to an atmospheric state or vacuum state, the processing time required for such setting is increased. There is also the problem that since the moisture, dust, and other foreign substances contained in the atmosphere are prone to enter, together with the wafer, the preliminary vacuum chamber 2 or the vacuum processing chamber 1, thus adversely affecting the production of semiconductor devices in terms of yield.

An object of the present invention is to provide semiconductor manufacturing equipment capable of reducing a dummy-wafer loading/unloading time during maintenance and the like and preventing the entry of moisture and dust into vacuum chambers.

(Means for Solving the Problems)

The semiconductor manufacturing equipment according to the present invention is constructed so that inside a

preliminary vacuum chamber disposed between a vacuum processing chamber and a wafer loader/unloader for loading and unloading semiconductor wafers, a dummy-wafer vacuum loading/unloading elevator capable of loading dummy wafers into or unloading them from said vacuum processing chamber, and a dummy-wafer conveying mechanism are provided.

(Operation)

In the above-described construction, during maintenance and the like, dummy wafers can be loaded from the preliminary vacuum chamber into the vacuum processing chamber, and there is no need to communicate the preliminary vacuum chamber with the atmosphere. This makes pressure control unnecessary, reduces processing time, and prevents the entry of the moisture and other foreign substances contained in the atmosphere.

(Embodiments)

Next, the present invention is described in further detail below using the accompanying drawings.

Fig. 1 is a plan view showing a first embodiment of the present invention. In the figure, numeral 1 denotes a vacuum processing chamber for vacuum-processing a semiconductor wafer W, and numeral 2 denotes a preliminary vacuum chamber provided so as to extend continuously to the vacuum processing chamber 1. Inside the preliminary vacuum chamber 2, a vacuum loading elevator 3 for wafers, and a

vacuum unloading elevator 4 are disposed, and a semiconductor wafer W is loaded into and unloaded from the vacuum processing chamber 1 along a conveying belt mechanism 5 extending from the vacuum loading elevator 3 and the vacuum unloading elevator 4. Also, in the atmosphere outside the preliminary vacuum chamber 2, a wafer loader/unloader 6 is provided, in which loading elevators 7 each for wafer loading, and unloading elevators 8 each for wafer unloading are disposed at the opposite side to the above-mentioned vacuum loading elevator 3 or vacuum unloading elevator 4, respectively.

In addition, in the above-mentioned preliminary vacuum chamber 2 of this first embodiment, a dummy-wafer vacuum loading/unloading elevator 9 and a dummy-wafer conveying belt 10 are installed, which makes a dummy wafer mountable on the dummy-wafer conveying belt mechanism 5, then dismountable therefrom, and loadable into and unloadable from the vacuum processing chamber 4.

According to this construction, when the need arises to load a dummy wafer into the vacuum processing chamber 1 during maintenance or the like, the dummy wafer is sent from the dummy-wafer vacuum loading/unloading elevator 9 within the preliminary vacuum chamber 2 to the dummy-wafer conveying belt 10, from which the dummy wafer is then mounted on the conveying belt mechanism 5 and loaded. Also,

after undergoing processing, the dummy wafer is unloaded into the dummy-wafer vacuum loading/unloading elevator 9 via the conveying belt mechanism 5. When the dummy wafer undergoes processing, therefore, since the preliminary vacuum chamber 2 does not need to be opened or closed in an attempt to communicate it with the wafer loader/unloader 6 exposed to the atmosphere, vacuum setting operations for wafer processing are made unnecessary and this allows reduction in processing time. In addition, at that time, the moisture or dust contained in the atmosphere does not enter the preliminary vacuum chamber 2 or the vacuum processing chamber 1.

Fig. 2 is a plan view showing a second embodiment of the present invention, and in the figure, the same sections as in Fig. 1 are each assigned the same numeral. In this second embodiment, inside a preliminary vacuum chamber 2, a dummy-wafer loading/unloading elevator 9 and a dummy-wafer handling mechanism 11 having a rotation axis and a dummy-wafer chuck hand, are equipped and a dummy wafer within the dummy-wafer loading/unloading elevator 9 is mounted on and dismounted from a wafer conveying belt mechanism 5 by the dummy-wafer handling mechanism 11.

In the second embodiment, dummy wafer loading and unloading can be implemented similarly to the first embodiment, except that operation differs during dummy

wafer mounting on/dismounting from the wafer conveying belt mechanism 5. The second embodiment has the advantage that since the conveying mechanical section functions as a rotation axis and a chuck hand, the entire dummy-wafer loading/unloading mechanism can be made compact.

(Effects of the Invention)

As described above, in the present invention, since the dummy-wafer vacuum loading/unloading elevator and the dummy-wafer conveying means are provided inside the preliminary vacuum chamber, dummy wafers can be loaded from the preliminary vacuum chamber into the vacuum processing chamber during maintenance and the like. In addition, during maintenance and the like, since the preliminary vacuum chamber does not need to be communicated with the atmosphere, this makes pressure control unnecessary, thus allowing reduction in processing time. Furthermore, since the preliminary vacuum chamber is not opened to the atmosphere, it is possible to prevent the moisture and dust in the atmosphere from entering the preliminary vacuum chamber or the vacuum processing chamber, and thus to improve a production yield of the semiconductor devices manufactured.

#### 4. Brief Description of the Drawings

Fig. 1 is a plan view showing a first embodiment of



the present invention; Fig. 2 is a plan view showing a second embodiment of the present invention; and Fig. 3 is a plan view of conventional semiconductor manufacturing equipment.

1 ... Vacuum processing chamber, 2 ... Preliminary vacuum chamber, 3 ... Vacuum loading elevator, 4 ... Vacuum unloading elevator, 5 ... Wafer conveying belt mechanism, 6 ... Wafer loader/unloader, 7 ... Wafer loading elevator, 8 ... Wafer unloading elevator, 9 ... Dummy-wafer loading/unloading elevator, 10 ... Dummy-wafer conveying belt, 11 ... Dummy-wafer handling mechanism, 12 ... Dummy-wafer loading/unloading elevator, W ... Semiconductor wafer.